Three Epochs of Artificial Intelligence in Health Care.

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Abstract

Importance

Interest in artificial intelligence (AI) has reached an all-time high, and health care leaders across the ecosystem are faced with questions about where, when, and how to deploy AI and how to understand its risks, problems, and possibilities.

Observations

While AI as a concept has existed since the 1950s, all AI is not the same. Capabilities and risks of various kinds of AI differ markedly, and on examination 3 epochs of AI emerge. AI 1.0 includes symbolic AI, which attempts to encode human knowledge into computational rules, as well as probabilistic models. The era of AI 2.0 began with deep learning, in which models learn from examples labeled with ground truth. This era brought about many advances both in people's daily lives and in health care. Deep learning models are task-specific, meaning they do one thing at a time, and they primarily focus on classification and prediction. AI 3.0 is the era of foundation models and generative AI. Models in AI 3.0 have fundamentally new (and potentially transformative) capabilities, as well as new kinds of risks, such as hallucinations. These models can do many different kinds of tasks without being retrained on a new dataset. For example, a simple text instruction will change the model's behavior. Prompts such as "Write this note for a specialist consultant" and "Write this note for the patient's mother" will produce markedly different content.

Conclusions and Relevance

Foundation models and generative AI represent a major revolution in AI's capabilities, ffering tremendous potential to improve care. Health care leaders are making decisions about AI today. While any heuristic omits details and loses nuance, the framework of AI 1.0, 2.0, and 3.0 may be helpful to decision-makers because each epoch has fundamentally different capabilities and risks.